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***Interactive comment on “Detailed source term estimation of the atmospheric release for the Fukushima Daiichi Nuclear Power Station accident by coupling simulations of atmospheric dispersion model with improved deposition scheme and oceanic dispersion model” by G. Katata et al.***

**Anonymous Referee #3**

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In this paper the authors propose a new estimation of the releases of several radionuclides during the Fukushima accident.

For that they use a modified version of the atmospheric dispersion model WSPEED-II – with a new deposition scheme – and the oceanographic dispersion model SEA-

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GEARN-FDM, together with air concentration and surface deposition measurements – augmented with respect to the one used in previous work.

Also, a detailed analysis of the recovered source is provided, comparing it with the events that took place during the nuclear accident.

A validation of the source is performed by comparing the simulated measurements provided by the new source with the real ones. These simulated measurements are obtained, first, using the WSPEED-II atmospheric dispersion model and then, using other proposed atmospheric dispersion models.

The article provides new insights on the releases during the Fukushima accident, and it fits within the scope of Atmospheric Chemistry and Physics. Hence I recommend it for publication after the following comments are addressed.

#### Major comments

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- In general, the article is too long. It should be written in a much more concrete and concise way, making it easier to understand for the reader.

- Section 2.2 Why, instead of posing the problem as a linear system (Stohl et al., 2012), the authors estimate the source unknowns one by one? Is there any advantages in using the method proposed in the paper with respect to (Stohl et al., 2012)? Using a linear system, the situation explained in p 14735 | 12 would be solved in a more reasonable way. The same applies for the correction of the source in section 2.3

- The explanation of the estimation methods is, in general, confusing. Many details should be clarified:

- How is the temporal discretization of the source defined, i.e., starting and ending points of each temporal element? Why is this discretization not regular? This explanation must be included in the manuscript.

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- The mathematical notation is, in general, quite confusing and makes the method description unnecessarily difficult to understand.
- Eq. (1), (3):  $Q_i$ ,  $M_i$  and  $C_i$  depend not only on space, but also on time. This must be indicated ( $Q_i(t)$ , for example). Also it is necessary to make clear the difference between time of emission and time of detection. For example, in Eq.1, the time of  $Q_i$  and time of  $M_i$  are different,  $Q_i(t_1)$ ,  $M_i(t_2)$ .
- Section 2.2 and 2.3 The measurements and the dilution factors may contain errors. The estimated source may be sensitive to these errors. How do you address this problem?
- p 14735 | 11 Explain why only the peak values are used.
- p 14736 | 25 How do you determine in which periods the plume flows towards the ocean?
- Section 2.3 In general, the subindexes of the variables are extremely confusing here, because they mix space and time. To make clearer what is what, the notation must be revised completely. For example in Eq. (4),  $Cn_j[k]$ , instead of  $C_{j,k}$
- p 14738 | 2 Where does this equality come from? A more detailed explanation should be included.
- p 14760 | 14 In 14759 | 13, you use the events that took place during the accident to asses your source, and thus claim that your source estimation is correct, and previous source estimations in the literature are not correct. But later, you compare again to the same previous estimations in the literature (which are supposedly wrong) and where they agree with your results, you claim that this again confirms the correctness of your results. This is not a consistent argument!

Minor comments

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- p 14735 | 10 What does it mean "if the data show a continuous time series"? The measurements are always discrete.
- p 14737 | 15 The variable name Cos can be mistaken with a cosine. A different name should be used.
- p 14737 | 11 typo "Note that the only the observational. . ."
- p 14738 | 2 Equation number missing.
- Section 3.2.1 Does it have sense to validate the source with the same measurements and model that were used to estimated it? Because the source that fits best with these measurements is the one that produces overfitting. If the same model and the same measurements are used for validation, then some kind of cross-validation technique must be used.
- Section 4.1 The wet venting at Unit 3 and DW pressure deficits do not directly imply that the major release took place at this time. If it does, you should argument it properly.
- p 14760 | 1 How do you know that the source changes drastically in this period? How do you asses that?
- A general correction of minor typos through the whole paper is necessary.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 14725, 2014.

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